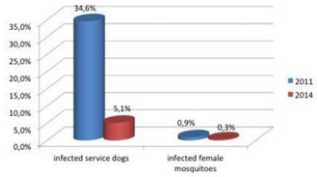
During the observation period infection of female mosquitoes was decreased from 0,9% in 2011 to 0,3% in 2014.



Conclusion: Studies have shown that in the Novgorod region adoptable conditions are present for formation of the foci of dirofilariasis. Detection of human dirofilariasis in Northwest of Russia has been associated with delivery of infected service dogs of Ministry of Internal Affairs. Service dogs are regularly seconded to work in the heartworm-endemic territories regions like as North Caucasus or Southern Russia. In our view, the circulation of Dirofilaria repens in the Novgorod region supports a high number of infected dogs and a lot of vectors of transmission. Abnormally warm summers of 2010 and 2011 contributed to the development of several generations of larvae vector transmission. These factors could lead to the forming the foci dirofilariasis in the Novgorod region and the emergence of autochthonous cases of Dirofilaria repens invasion in humans.

http://dx.doi.org/10.1016/j.ijid.2016.02.808

Type: Poster Presentation

Final Abstract Number: 43.070
Session: Poster Session III
Date: Saturday, March 5, 2016
Time: 12:45-14:15
Room: Hall 3 (Posters & Exhibition)

Antibodies to plasmodium falciparum glutamic acid rich protein (PfGARP) inhibit parasite growth by arresting trophozoite development

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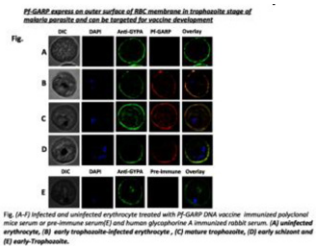
Background: Malaria affects almost one-half of the world's population and causes more than 600,000 deaths annually. Young children in malaria endemic areas of Africa have the highest mortality rate because of their immature immune systems. In previous vaccine discovery efforts, we developed a differential screening method using plasma from children who were resistant or susceptible to falciparum malaria. Using this approach, we discovered PfSEA-1. Antibodies to PfSEA-1 predict resistance to severe disease in two yr old children, block schizont egress from infected RBC *in vitro*, and vaccination with rPbSEA-1A protects mice from *P. berghei* ANKA challenge (Raj et. al Science 2014).

Methods & Materials: We have now adapted our differential screening method to field parasite-derived phage display libraries. In differential bio-panning assays, PfGARP (aa 410-673) was recognized by plasma pooled from resistant (n=11) but not susceptible (n=14) children participating in our birth cohort in Muheza, Tanzania. To further characterize PfGARP, we generated mouse antibodies against this immuno-relevant, highly invariant region (PfGARP-A) and performed growth inhibition (GIA) and immunolocalization studies. For GIA, 3D7 parasites were synchronized to the ring stage and plated at 0.3-0.4% parasitemia in the presence of anti-PfGARP-A or pre-immune sera (1:10 dilution). Parasites were cultured for 48 hrs and ring and early trohozoite stage parasites were enumerated.

Schematic of phase display technique

Results: Anti-PfGARP-A inhibited parasite growth by 99% compared to controls ($P < 0.001$). In confocal studies, PfGARP localized to the RBC membrane in trophozoite and early schizont infected RBCs, but not to other parasite stages or uninfected RBC. To determine the mechanism of growth inhibition we performed trophozoite arrest assays (TAA) using anti-PfGARP-A. For TAA, 3D7 parasites were synchronized to the ring stage and plated at 5% parasitemia in the presence of anti-PfGARP-A or pre-immune mouse sera (1:10 dilution). Parasites were cultured for 36 hrs and trophozoite stage parasites were enumerated. Anti-PfGARP-A arrested trophozoite progression by 99% compared to controls ($P < 0.001$)



Localization of PfGARP

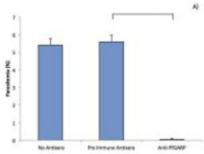


Fig. 3D7 parasites were synchronized to the ring stage and plated at 0.3-0.4% parasitemia in the presence of anti-PfGARP-A or pre-immune sera (1:10 dilution). Parasites were cultured for 48 hrs and ring and early trophozoite stage parasites were enumerated. Anti-PfGARP-A inhibited parasite growth by 99% compared to controls ($P < 0.001$).

Growth Inhibition Assay

Conclusion: These data support Pf-GARP as a novel vaccine candidate for pediatric *falciparum* malaria. By blocking trophozoite development, PfGARP may synergize with vaccines targeting hepatocyte and red cell invasion and schizont egress.

http://dx.doi.org/10.1016/j.ijid.2016.02.809